

**NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety  
Washington, D.C. 20594

April 6, 2010

**Group Chairman's Factual Report**

**OPERATIONAL FACTORS**

**DCA10IA022**

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## A. ACCIDENT

Operator: PSA Airlines, Inc.  
Location: Yeager Airport, Charleston, West Virginia  
Date: January 19, 2010  
Time: 1623 eastern daylight time<sup>1</sup>  
Airplane: Bombardier CL-600-2B19, Registration Number: N246PS

## B. OPERATIONAL FACTORS / HUMAN PERFORMANCE GROUP

B. David Tew - Chairman Operational Factors Division (AS-30) National Transportation Safety Board 490 L'Enfant Plaza East, SW Washington, DC 20594-2000	Katherine Wilson – Member Human Performance Division (AS-60) National Transportation Safety Board 490 L'Enfant Plaza East, SW Washington, DC 20594-2000
Jacques Nadeau - Member Bombardier – Chief Customer Liaison Pilot 13100 Henri-Fabre Blvd. Mirabel, QC, Canada J7N 3C6	James Fee – Member Federal Aviation Administration 800 Independence Ave., SW Washington, D.C. 20591
Darren Harris – Member PSA Airlines, Inc. – Air Crew Program Designee & Check Airman 3400 Terminal Drive Vandalia, OH 45377	J.D. Panyko - Member Airline Pilots Association CRJ 200/700 Check Airman PSA Airlines Inc. 3400 Terminal Drive Vandalia, Ohio 45377

## C. SUMMARY

On January 19, 2010, PSA Airlines (d.b.a. US Airways Express) flight 2495, a Bombardier CL600-2B19, registration N246PS, rejected the takeoff and ran off the end of the runway at Yeager Airport, Charleston, West Virginia. The airplane stopped in the engineered materials arresting system (EMAS) installed in the safety area. There were no injuries to the 31

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<sup>1</sup> All times are eastern daylight time (edt) based on a 24-hour clock, unless otherwise noted. Actual time of accident is approximate, determined by the Air Traffic Control (ATC) transcripts.

passengers or 3 crew members onboard and the airplane received minor damage. The flight was operating under the provisions of 14 CFR Part 121 and its intended destination was Charlotte/Douglas International Airport, Charlotte, North Carolina.

## **D. DETAILS OF THE INVESTIGATION**

The NTSB investigators on the Operations Group conducted interviews with incident crew members on January 28, 2010.

NTSB investigators reviewed PSA Airlines operational manuals

### **1.0 FLIGHT CREW INFORMATION**

The accident flight crew consisted of a captain and first officer. The flight crew had flown together several times and had flown into Yeager Airport (CRW), Charleston, West Virginia numerous times as this was a frequent destination in the PSA Airlines flight schedule.

Both crewmembers were current and qualified under PSA Airlines, Inc. and FAA requirements.

#### **1.1 Captain Thomas Joseph Morrow**

Captain Morrow was 38 years old.

Date of hire with PSA Airlines, Inc.: June 21, 1999

FAA records of Captain Morrow indicated that:

Private Pilot - Airplane Single Engine Land certificate was issued on April 24, 1991.

Private Pilot - Airplane Single Engine Land – Instrument Airplane certificate was issued on October 4, 1992.

Commercial Pilot – Airplane Single Engine Land – Instrument Airplane certificate was issued on February 3, 1995.

Commercial Pilot – Airplane Single and Multi Engine Land – Instrument Airplane certificate was issued on November 1, 1996

Airline Transport Pilot Airplane Multi Engine Land initial certificate was issued on April 3, 2002

Flight Instructor- Airplane Single Engine certificate was originally issued on June 13, 1996.

Flight Instructor- Airplane Single and Multi Engine – Instrument Airplane certificate was originally issued on May 9, 1997.

#### **Pilot certificates and ratings held by Captain Morrow at time of the accident:**

FLIGHT INSTRUCTOR (issued June 11, 2009)

AIRPLANE SINGLE AND MULTI ENGINE

INSTRUMENT AIRPLANE  
VALID ONLY WHEN ACCOMPANIED BY PILOT CERTIFICATE

AIRLINE TRANSPORT PILOT (issued January 19, 2008)

AIRPLANE MULTIENGINE LAND  
DO-328, CL-65  
COMMERCIAL PRIVILEGES  
AIRPLANE SINGLE ENGINE LAND  
Limitations:  
CL-65 CIRC. APCH. VMC ONLY

MEDICAL CERTIFICATE FIRST CLASS (issued April 3, 2009)

Limitations: Must wear corrective lenses

**Training and Proficiency Checks:**

PSA Airlines, Inc. Initial New Initial New Hire training completed on August 18, 1999  
Initial upgrade to captain [Dornier 328]: April 3, 2002  
Initial Type Rating CL-65: November 1, 2004  
Initial Captain training in CL-65 completed: October 1, 2004  
Last recurrent simulator training: August 6, 2009  
Last recurrent ground training: August 24-25, 2009  
Last Line Check: August 6, 2009  
Last Proficiency Check in CL-65: February 25, 2009

No record of failures during company training.

**Flight Times:** approximate based on interviews and PSA Airlines, Inc. employment records.

Total pilot flying time	9,525 hours
Total CL-65 flying time	4,608 hours
Total CL-65 PIC time	4,608 hours
Total flying time last 24 hours	4 hours
Total flying time last 7 days	12 hours
Total flying time last 30 days	39 hours
Total flying time last 90 days	169 hours
Total flying time last 12 months	855 hours

A review of FAA records found no prior accident, incident or enforcement actions.

## 1.2 First Officer Robert Eugene Saltsgaver III

F/O Saltsgaver was 44 years old.

Date of hire with PSA, Inc.: July 7, 2007

FAA records of F/O Saltsgaver indicated that:

Private Pilot - Airplane Single Engine Land certificate was issued on August 8, 1992.

Private Pilot - Airplane Single Engine Land – Instrument – Airplane certificate was issued on April 6, 2005.

Commercial Pilot – Airplane Single Engine Land – Instrument Airplane certificate was issued on June 9, 2005.

Commercial Pilot – Airplane Single and Multi-Engine Land – Instrument Airplane certificate was issued on July 17, 2005.

Commercial Pilot – Airplane Single and Multi-Engine Land – Instrument Airplane – CL-65 SIC Privileges certificate was issued on August 16, 2007.

### **Pilot certificates and ratings held by F/O Saltsgaver at time of accident:**

COMMERCIAL PILOT (issued August 16, 2007)

AIRPLANE SINGLE AND MULTIENGINE LAND  
INSTRUMENT PRIVILEGES  
CL-65

CL-65 SIC PRIVILEGES ONLY  
CL-65 CIRC APCH – VMC ONLY

MEDICAL CERTIFICATE FIRST CLASS (issued April 20, 2009)

Limitations: None

### **Training and Proficiency Checks:**

PSA Airlines, Inc. Initial New Hire training completed on August 17, 2007

Last Proficiency check in CL-65: August 20, 2009

Last recurrent ground training: August 27-28, 2009

No record of failures during company training.

**Flight Times:** based on interviews and PSA Airlines, Inc. employment records.

Total pilot flying time	3,029 hours
Total flying time in CL-65	1,981 hours
Total flying time last 24 hours	4 hours

Total flying time last 7 days	12 hours
Total flying time last 30 days	103 hours
Total flying time last 90 days	249 hours
Total flying time last 12 months	928 hours

A review of FAA records found no prior accident, incident or enforcement actions.

## **2.0 WEIGHT AND BALANCE**

The airplane was determined to be within weight and balance limits.

Taxi weight - 44,671 lbs

Max taxi weight - 53,250 lbs

Takeoff weight was approximately - 44,371 lbs (Taxi weight minus 300 lbs. taxi fuel)

Max takeoff weight Aircraft Limit - 53,000 lbs

Fuel on board - 6,300 lbs

Passenger weight - 30 X 189 = 5,670 lbs.

Bag weight – 770 lbs.

Cargo weight - 0

BOW – 31,931 Lbs.

## **3.0 AERODROME INFORMATION**

Airport information was obtained from the Federal Aviation Administration's - Airport Facility Directory (AFD). At the time of the accident, Yeager Airport elevation was 981 feet above mean sea level (MSL), and was located three miles from the city of Charleston, WV. The airport had two hard surface runways. AFD data indicated runway 5/23 was grooved asphalt and was 6,302 feet long and 150 feet wide. Runway 15/33 was grooved asphalt and concrete and was 4,750 feet long and 150 feet wide.

Runway 5 had high intensity runway lights (HIRL), centerline lights (CL), touchdown zone lights (TDZ), Runway End Identification Lights (REIL), a Visual Approach Slope Indicator on the left side (VASI-L) and a touchdown zone and rollout zone runway visual range indicators (RVR). Runway 23 had high intensity runway lights (HIRL), centerline lights (CL), a Visual Approach Slope Indicator on the right side (VASI-R) and a touchdown zone and rollout zone runway visual range indicators (RVR). There was an Engineered Materials Arresting System (EMAS) system located at the end of runway 23.

## **4.0 PILOT INTERVIEW SUMMARIES**

### **4.1 Interview: First Officer (F/O) Robert Eugene Saltgaver III – PSA Airlines, Inc.**

**Date: January 28, 2010**

**Location: Phone interview**

**Time: 1000 EST**

**Present were:** David Tew, Katherine Wilson - National Transportation Safety Board (NTSB); Darren Harris – PSA Airlines, Inc.; JD Panyko – Air Line Pilots Association (ALPA), Jacques Nadeau – Bombardier, James Fee – Federal Aviation Administration (FAA).

Mr. Saltsgaver was represented by Neal Davis, Airline Pilots Association.

During the interview, Mr. Saltsgaver stated the following information:

His date of hire at PSA Airlines, Inc. was July 7, 2007. He was based at Knoxville, TN.

He had about 3,500 total flight hours of which about 1,965 were on the Bombardier CRJ as a first officer (F/O). He had about 1,000 flight hours as pilot-in-command (PIC). He had only been a F/O at PSA and had not flown as captain. In the military, he was a flight engineer (F/E) on the C-5 Galaxy airplane and was currently a training and education manager. He was still in the military and did military duty one weekend a month or 15 days a year. He did not fly outside his work at PSA.

Prior to PSA, he worked as a public safety officer for the Knoxville Airport Authority for about 10 years. He did some contract flying as a sideline. He had no previous accidents, incidents, or violations. He had received a letter of warning from the Federal Aviation Administration (FAA) for flying over the Naval Observatory in Washington, D.C. He had never failed a proficiency check. He had not had any problems during training.

He had no limitations on his FAA medical certificate. He did not wear glasses. He was not taking any medications. On the day of the incident, he felt “fine” and well rested. He was in good health.

He was based in Knoxville, TN. He lived about 20 minutes from the airport. Prior to the event trip, he had about 3 or 4 days off. He said it was normal to have 2 to 3 days off. He said he usually flew 3 or 4 day trips. The longest trip he had flown lasted 5 days. He said most of their trips were for 3 or 4 days.

He had flown with the incident captain previously. The captain did a portion of his Initial Operating Experience (IOE) on the airplane and he also flew a whole monthly sequence with him in January. The captain was a check captain. He said the captain was “easy going”, a very good instructor, confident in his abilities and had good people skills. The captain seemed alert was in a good mood on the day of the incident. He would rate the incident captain “in the top” in comparison with other captains he had flown with. He had heard no complaints about the captain and got along “great” with him. He said he had been out with the captain socially. He said the captain got along with the passengers and the flight attendant (F/A).

He was asked what sleep he had gotten over Friday, Saturday and Sunday and he responded 7-8 hours each night. He felt like he got enough rest. He said he normally needed at least 6 hours of sleep a night to feel rested and tried to get 6-8 hours.

He said that he might have stayed up until 2300 on Saturday night, January 16, 2010. He said he awoke on Sunday morning at about 0700 or 0800 and said he felt he had gotten enough rest.

F/O Saltsgaver said that he spent Sunday, January 17, 2010 at his girlfriend's house playing with her son. He said he played video games, cooked and cleaned. He did not recall going "out of the house". He said he awoke and went to bed early that Sunday. He said they go to bed early because his girlfriend had to get up early. He went to bed about 2100.

F/O Saltsgaver said he did not recall what he did on Monday, January 18, 2010. He said he thought he went to bed between 2100 and 2200.

The event occurred on Tuesday, January 19, 2010. It was the first day of his flight sequence and was the fifth flight leg of the day. He had checked in about 0700 to 0900 for his flight sequence. The first flight of the day was from McGhee Tyson Airport (TYS), Knoxville, Tennessee to Charlotte / Douglas International Airport (CLT), Charlotte, North Carolina. They then flew from CLT to Asheville Regional Airport (AVL), Asheville, North Carolina. They then flew from AVL back to CLT. They then flew from CLT to Yeager Airport (CRW) Charleston, West Virginia. The incident occurred when they were attempting to fly from CRW back to CLT. After going to CLT, they were scheduled to fly a leg to Roanoke, VA. It was a continuous day of duty. They normally flew about 4 legs a day, but would have 6 legs in a day "every now and then". The length of the legs varied. The event day did not seem like a long day. The workload on the day of the event was standard. They were on time and there was no rush to get things done. He was in a good mood. They were scheduled to finish their day around 1930. On the day of the event, they had about a 45 minute break at AVL and he got a sandwich.

As scheduled, they were on the ground at CRW for about 30 minutes. During that time, he performed a walk-around inspection of the airplane. The captain was the pilot flying (PF) for the incident flight. The weight of the airplane for the incident flight was about 44,000 to 45,000 lbs. He did not recall what the takeoff speeds for the incident flight were. As usual, they received their takeoff speeds from the aircraft communications addressing and reporting system (ACARS) on the airplane. He said they had no problems prior to departure from the gate. He said they performed the Before Start checklist and he thought the captain performed a departure briefing which was a standard briefing. He said they always got flight information from the ACARS before they shut the door. The ACARS would have the weights, takeoff speeds, flap setting, and trim setting. He said they always used a flap 20 setting for takeoff at CRW. They did an After Start checklist. At CRW, they usually swing the gate away. He said they may have pulled off the gate with only one engine running.

He said the captain called for flaps 20 and the Taxi checklist and the F/O performed the checklist. F/O Saltsgaver said he read the aircraft weight, flap setting, called the speeds and called out the caret setting<sup>2</sup> for the engines. He was aware that a flap 20 setting was used at

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<sup>2</sup> Caret setting – the PSA Ops group member stated that the caret setting was the N<sub>1</sub> setting that was used for takeoff.

CRW. When asked what he normally did in response to the flaps item on the checklist, he said he touched the flap handle to make sure it was at the right setting and he looked at the Engine Indicating and Crew Alerting System (EICAS) to verify the flap setting and then would confirm the ACARS information before responding to the flap item on the checklist. He would also look at the FMS on the captain's side to verify that they all matched up. As the incident flight taxied, he "vaguely" recalled stating "flaps 8, green, trim 7.2". He did not recall saying flaps 20.

The taxi checklist was called for after they were clear of ground personnel. He said that as they started to turn out, he looked to his right to be sure they were clear. He also said they were engaged in "small talk" as they started moving but nothing that was distracting.

He said they pulled about 50 feet away from the gate and stopped and waited because they had been given a takeoff time of a "quarter after four". They had to wait on the ramp for about 25 minutes.

As part of the taxi checklist, when they came to the takeoff data item, the F/O said he would read the takeoff weight, the flap setting for takeoff, the "V" speeds, the trim setting for takeoff and what the engine power carets<sup>3</sup> should indicate for takeoff power and the captain would respond "set". The company procedure was for the captain to also say the flap setting and "green" and state the trim setting. He said the only time the flaps setting was verified was during the Taxi checklist. He said there were no problems during the taxi.

As they were taxiing to the end of the runway, he did the Before Takeoff checklist. He would look for the "takeoff config"<sup>4</sup> indication.

When asked about the takeoff briefing, he responded he did not recall what was said "word for word". He said he thought the captain did the takeoff briefing. He said it was so standard for them, he did not see why it would not have gotten done. A departure briefing was required before flight. It usually included the first fix, altitudes and any turns before 400 feet altitude. He thought the briefing included a straight out departure. He said the only distraction was a large flock of birds but he did not recall that being that big a distraction. He said after the Taxi checklist had been performed, he would go to the performance page not the ACARS page on the FMS. He said only the weight card<sup>5</sup> would show the flaps settings.

He thought he performed the Before Takeoff checklist at an "average speed" because they were not in a rush. He said he had to watch himself at times because he had a tendency to go fast. He had been trained to be clear and loud enough for the other pilot to hear you when performing checklists. He said the captain never said anything to him about the speed at which the checklist was performed.

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It was displayed on the EICAS after the temperature had been inserted into the flight management system (FMS).

<sup>3</sup> Engine power carets – see footnote 1

<sup>4</sup> Takeoff Config – was a visual alert on the forward instrument panel that would alert the crew to an abnormal takeoff condition.

<sup>5</sup> Weight card - The PSA Ops group member stated that the weight card, which was also called a speedbook, was a flip card that the F/O selected to the appropriate weight after the takeoff weight had been calculated.

He said the full length of the runway was available and they used all of the runway. He said they had a light head-on headwind for takeoff.

The captain was the pilot-flying (PF). There were no concerns about taking off on that runway. He said there was a slight upslope on the runway and then the runway went to level or even a little downhill. They lined up on the runway. The captain pushed the throttles forward to about 70%. Both engines spooled up. The power was advanced to the caret setting for takeoff. The captain said "set thrust". F/O Saltsgaver said he set takeoff thrust and said "thrust set". He said he watched the cockpit indications and looked outside. He called out "80 knots". The captain responded "checks". F/O Saltsgaver said he never called out  $V_1$ . He said the captain did not call out  $V_1$ . F/O Saltsgaver said that when they were at about 80 knots, he heard a "click". He then heard a triple chime aural alert and saw "a red indication" which was the master warning. There was an alert on the EICAS that came on but as he looked toward the EICAS to see what was indicated, it went away. Before the triple chime aural sounded, he did not notice anything wrong or unusual. He said he heard the captain say "something," but did not know what he said. F/O Saltsgaver said the captain told him later that it was the "config flaps" alert that came on. The captain immediately rejected the takeoff.

He said they were "at most" about a  $\frac{1}{4}$  of the way down the runway, parallel to the Air National Guard aircraft, when they started the rejected takeoff (RTO). He said he vaguely remembered seeing the airspeed was 100 kts. He did not recall if the spoilers were deployed during RTO. He said his concerns were about where the aircraft was going and at what speed. He thought they began the RTO before reaching  $V_1$ .

He said he did not see the captain move the flaps. He said he was looking outside and inside, and may have also glanced at the EICAS until they got to  $V_1$ . The company procedure for an RTO was to callout "reject", but he did not recall if the captain did. F/O Saltsgaver said anyone can call for a RTO. The F/O said during the RTO he did not see the captain go into reverse because he was looking outside the airplane to see that they were maintaining centerline and at the airspeed. He did not recall calling out any airspeeds during the RTO. He said that on landing he normally called out "80 knots" and "60 knots". He saw the end of the runway coming fast. He said that during a RTO the brakes were supposed to be applied. He said during the last 1,000 to 1,500 feet of runway, he got on the brakes also and was applying maximum braking. He said he was trying to help the captain with braking. He thought the spoilers extended during the abort but did not recall if the reversers came out. He said they were using maximum braking so he could not tell if he felt reverse power. He did not know if the nose of the airplane had been pulled up during the event.

He did not know if the antiskid activated during the RTO. He said he later saw extensive skid marks on the runway and blisters on the tires.

He said he did not recall what happened after they stopped. He thought they told everyone to remain seated and called the purser to the flight deck. He said he asked the captain if he should run the after landing checklist. He said they did an After Landing checklist and thought he inadvertently retracted the flaps although he shouldn't have. He recalled he performed the shutdown checklist. He did not recall if the captain asked about the passengers after they had

stopped. The captain did talk to the F/A. After the cabin door was opened, F/O Saltsgaver said he later asked the F/A if everyone was okay. F/O Saltsgaver said he stepped off the airplane to talk to the aircraft rescue and fire fighting (ARFF) personnel. Whether they need to do anything after stopping after a RTO, was up to the captain. The captain said there was no need to evacuate since they had come to a safe stop and they did not need the passengers wandering about especially as they were on top of the EMAS.

He said that during a landing he would call out “spoilers and two reverse”, then 80 knots and 60 knots. He did not recall if he was supposed to call those out during an RTO. He thought “two in reverse” was a callout during an RTO. He said the spoilers would extend automatically during an RTO. He said the spoilers retract automatically due to the speed of the wheels.

F/O Saltsgaver said that before reaching  $V_1$ , they could reject for anything. If they did a RTO, they were supposed to use the thrust reversers and maximum braking.

He did not recall what the weather was at the time of the event. He did recall a cloud cover. He said the runway was dry.

He had flown into CRW about 20-30 times previously. The last time into CRW was a week to 2 weeks earlier. It was a pretty normal route for him.

F/O Saltsgaver said he thought they had flown the same airplane all day on the day of the incident. He did not recall any logbook write-ups on the airplane.

He had a RTO previously and it was with the same captain. They had a config spoiler indication that occurred before the engines were even spooled up. They pulled off the runway onto the ramp. They called maintenance who gave them some advice. They ran some checks on the airplane and then took off without any issue. He did not recall having a RTO at a speed above 80 knots.

When asked about sterile cockpit, he responded that when the airplane was moving, they were not supposed to be discussing anything that was not pertinent to the flight. He said they were not maintaining a sterile cockpit. He said there was some “side” conversation. He recalled there was some talk about taxiways and lines on the pavement. He said the company training on sterile cockpit was very clear. He said “for the most part” most people adhered to sterile cockpit rules, but that it was sometimes difficult not to make comments. Some people are just talkers. He said he had never seen talking put us “in harm’s way”. He said, on the flight to CRW, they talked at altitude. He did not recall if reading was allowed at altitude.

He said that fatigue depended on where they were going and the length of the flight legs.

An approach briefing was required before landing. It usually included a briefing of the approach plate, runway length, and where the turnoff was planned for.

He said he knew there was EMAS [Engineered Materials Arrestor System] at the end of the runway.

F/O Saltsgaver said that CRW was considered a “special” airport for PSA. He said he did not recall the restrictions on CRW. He thought that one pilot had to have flown into CRW within the past 90 days. He said he flew the airplane into CRW and there was no rule against F/Os flying in there. He said there was a company limit for a 5,000 foot runway and the captain had to land.

After the event, they were drug and alcohol tested. They were given a breath test and a urine test. He assumed it was arranged by the company.

There had been no major changes to his health recently. He had some financial changes because he went through a divorce. He said the financial changes did not impact his performance in the airplane. He did not have any hearing problem. He was taking medication because his triglycerides were high. He did not notice any effects from taking the medication. He did not recall if he took his medication on the morning of the event. He said he drank alcohol socially and the last time was in December. He did not smoke. For the 72 hours prior to the event he did not take any additional medication.

He said all his airplane training was performed in Vandalia, OH by the company.

He said during training there were several reasons to perform a RTO such as a heart attack, seat sliding back, nose wheel steering problem, engine failure, engine fire, or a configuration problem. He said that below 80 knots, they would abort for anything abnormal. He said above 80 knots the decision to abort was on a “case by case” like an engine fire. He said above  $V_1$  you would continue the takeoff. He said they were not supposed to abort a takeoff if they were past  $V_1$ . He said some RTOs in training were above 80 knots. The procedures for a RTO were to call for the reject, retard the throttles, reverse power and perform maximum braking. The pilot not flying (PNF) duties during a RTO were to call out the airspeeds as we slowed down; nothing with the control column.

He did not recall any fatigue training.

He said he got crew resource management (CRM) training and thought it lasted a couple of hours but may have lasted a day. He said he got some CRM training in the military. He thought the training he received at PSA was “top notch”.

He said abort criteria was not briefed before flight and it was not required in their procedures. They only briefed a heading change if it was required for an engine failure.

He said the flight operations manual (FOM) and the pilot operating handbook (POH) contained their operating procedures. He said he received a printed POH when he was hired. He said he was later required to turn in his printed manuals and now had electronic copies of the manuals. He did not have internet access and it was difficult for him to get timely updates.

He said that when they were in the simulator, they did not have an ACARS and instead used a “speedbook”<sup>6</sup>.

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<sup>6</sup> Speedbook – see footnote 3

He said he did not have anyone tell him if he was doing the ACARS right. He did not recall anyone saying that they needed to check the ACARS for the flap setting. He was not aware of a change in the use of ACARS since he had been at PSA except for the use of the “economy” setting. He did not recall if his checkairman instructed on the ACARS during his IOE.

He said he had seen the airspeed indication “bounce” a little bit during takeoff and thought it was due to gusts. He did not recall seeing the airspeed indication “bounce” on the event takeoff more than normal.

He had not received any commendations.

The interview ended at 1156.

#### **4.2 Interview: Captain and Check Airman Thomas Joseph Morrow– PSA Airlines, Inc.**

**Date:** January 28, 2010

**Location:** Teleconference

**Time:** 1300 EST

**Present were:** David Tew, Katherine Wilson - NTSB, Jacques Nadeau – Bombardier; JD Panyko – ALPA; Darren Harris – PSA Airlines; James Fee - FAA

Captain Morrow was represented by Neal Davis, Airline Pilots Association.

In the interview, Captain Morrow stated the following:

He was 38 years old. His date of hire at PSA was June 21, 1999. He had about 9,500 hours total flight time and 4,500-5,000 hours on the CRJ, all of which was PIC time. He had been a check airman on the CRJ for about 3 years. He had never been a check airman on another airplane.

Prior to being hired by PSA, Captain Morrow worked for about 2 years at Pro Flight Center at Beaver County Airport, located north of Pittsburgh. He was an assistant chief flight instructor there and flew as a captain on the Piper Navajo Chieftain for their Part 135 operations. Before that, he was a flight instructor. Captain Morrow did not fly outside of work.

Before becoming a captain on the CRJ, Captain Morrow was a first officer, then a captain, and then a reserve captain on the Dornier 328. He had been based in Pittsburgh until they closed that base while he was training for the CRJ. Captain Morrow was based out of Knoxville, TN. He lived in Knoxville, about 25 minutes from the airport. Captain Morrow was also typed to fly the CRJ-700 however they did not fly that airplane out of Knoxville, TN. He only saw the CRJ-700 during his proficiency training.

He did not take any medications and was not on any medications, prescription or non-prescription at the time of the incident. In the 72 hours before the incident, he did not take any drugs, prescription or non-prescription, that might have affected his performance. He did not

have a cold or other illness lately and indicated that his health was good. In the past year, he had not had any major changes in his health, good or bad. When not working, he said he needed maybe 6 hours of sleep to feel rested. Captain Morrow wore corrective lenses and was wearing contacts at the time of the incident. He did not have any hearing problems. He drank alcohol occasionally but did not recall the last time he had a drink before the incident. He did not smoke.

He had not experienced any recent changes to his financial situation or personal life.

Captain Morrow said he had not been involved in any accidents, incidents or violations prior to this incident. He had never failed a check ride nor experienced training problems at PSA or prior to joining PSA.

He had just finished a trip on the Friday before the incident trip. Nothing special happened during the weekend. He thought his sleep and wake times on Sunday were similar to that of Monday. He did not recall his activities on Sunday.

He thought he awoke about 0630 on Monday, January 18, and that time was “pretty usual” for him as he had a young child at home. He spent the day at home with his family. He went to bed about 2200-2300 and thought he got a good night’s sleep. On the morning of the incident, he awoke about 0630-0700. He felt rested the day of the flight and on the incident leg also.

He had flown with first officer (F/O) Saltsgaver before. He recalled flying a full month with him one other time but did not remember when. Captain Morrow was also a check airman during F/O Saltsgaver’s IOE (initial operating experience). He did not recall anything unusual about the training and said it was probably about 2 years ago. He said he also instructed captains.

Captain Morrow said F/O Saltsgaver was a good pilot with good skills flying the airplane, good procedures and good CRM. He said F/O Saltsgaver always completed checklists, but said in this instance “we missed things”; in general Captain Morrow thought F/O Saltsgaver did things thoroughly. Asked to compare F/O Saltsgaver’s proficiency as a pilot to other first officers, he said the F/O was “normal”. Asked what F/O Saltsgaver’s greatest strength was as a first officer, he said he would have to think about it. Asked if there were areas where he thought F/O Saltsgaver could improve, he said “no, I guess not” but also said “obviously we could all improve. He never heard anyone complain about flying with F/O Saltsgaver.

He said his and F/O Saltsgaver’s moods on the day of the incident were “fine” and F/O Saltsgaver was in “good spirits” and alert. He said they got along well together. He did not see how F/O Saltsgaver got along with passengers or the flight attendant.

The incident occurred on the 5<sup>th</sup> leg of the 1<sup>st</sup> day (January 19, 2010) of a 3 day trip pairing. Captain Morrow checked in that morning at 0854 in Knoxville.

He said the schedule on the day of incident was McGhee Tyson Airport (TYS), Knoxville, Tennessee to Charlotte / Douglas International Airport (CLT), Charlotte, North Carolina, then to Asheville Regional Airport (AVL), Asheville, North Carolina, then to CLT, and then to Yeager Airport (CRW) Charleston, West Virginia, then to CLT, and then to Roanoke Regional

Airport/Woodrum Field (ROA), Roanoke, VA. The incident occurred on the takeoff roll of the leg from CRW to CLT.

He said the number of legs in a day varied. On the day of the incident they had a number of short legs so 6 legs were typical. They did a lot of legs like CLT to Fayetteville, NC or Augusta, GA. If all of the legs were short legs, 6 legs were typical. Asked if the number of legs flown in one day impacted fatigue, he said it would depend on other factors like whether they had a short layover the night before or an early start, with only a few legs but a 13 hours duty day. He did not think there was a difference when the number of legs differed. He said almost every trip he flew was different. The day of the incident was a normal day. On the day of the incident, he said they did not have any rest breaks. The flights were all quick turns. They had a 39 minute turn with a plane swap in CLT and the other turns were about 40 minutes. The incident flight crew was not in the same airplane all day. Captain Morrow said they got a new airplane on their leg from CLT to CRW. He said there was nothing about the workload on the day of the incident that stood out to him, but maybe the plane swap they had in the short period of time. He said workload was normal until the warnings. He said he was sure he ate during the day; he usually would pack a lunch box.

They were on the ground in CRW for about 26 minutes, and during that time, Captain Morrow went in the terminal to use the facilities. He said it was a normal operation on the ground there.

There were no MELs [minimum equipment list maintenance items] or mechanical write ups on the incident plane.

Captain Morrow had flown into CRW a lot but he was not sure how many times. He thought more than 50 times. He had not flown into CRW recently and said it had probably been over a month since his last time. He said CRW was a special airport because of mountainous terrain; Washington, D.C. was also a special airport.

Captain Morrow guessed that the takeoff weight of the airplane for CRW was around 48,000 pounds.

Captain Morrow said they taxied out; there was no push back from the gate. They had a 1615 wheels up time so he was pretty sure that about 1555 they started one engine and turned away from the gate. They moved maybe a half a plane's length away from the gate and stopped. Asked if he called for the Before Start checklist, he said he thought he would have. He would call for it and the first officer would read it. He said he would hope he conducted a departure briefing as he always did. He said it was a standard briefing that they did on every leg and included reviewing the ATIS, their clearance, making sure the radios were tuned properly, going over the FMS and flight plan if they had not already done so, and on the primary flight display they would make sure their speeds were set, the runway heading, correct navigation needles (the white needles), flap retraction altitude and initial altitude, any pertinent information, and engine failure procedures. Captain Morrow said they completed the After Start checklist.

The Taxi checklist was completed after both engines were started. He could not remember when they started the second engine. He said they were looking at the time and it was close to wheels up time. He was “pretty sure” they started it before they started moving.

When asked if it was always necessary to use a flaps 20 setting for takeoff at CRW, he said he assumed if it was a nice cold day with only a few passengers on board, they could possibly do a flaps 8 takeoff. He said there was not a flaps 20 only takeoff requirement for CRW. He was “99.99% sure” that the when he looked at the ACARS information it said to use flaps 20 and he called for “flaps 20 taxi check”. He said they completed the Taxi checklist after they were already moving. He did not think the F/O was distracted by anything during taxi on the day of the incident.

He said the Taxi checklist item “takeoff data...verify” involved verifying flaps, takeoff speeds, N1 bug and takeoff weight. Taxi checklist item “Flaps/trim...verify” involved verifying flap settings and that all trim (aileron and rudder) were in the green (he said it should be zero), and the correct stab trim was set.

The flight crew was supposed to look at the ACARS, and see if it said flaps 20 or flaps 8, and then look at the EICAS to verify that the flaps were properly set. When he would verify the flaps, he always taught F/Os to verify the airplane flap setting, touch the flap handle and go through the other things. He would normally look at the ACARS, flaps, then the EICAS which would show what the flaps were set at. He did not know if he did this and thought he just repeated back what the F/O said which was obviously incorrect. He believed he did that because he was distracted by what was going on outside the airplane. He said there had just been a lot of construction done at the airport. Once they were leaving the ramp, he remembered thinking the taxi line was farther to the right than it should have been. He had to put the right main gear very close to the ramp edge. As a result, his attention was more outside the airplane and he just gave the F/O the response back.

He said the F/O would read V speeds off of the ACARS and the captain would verify them by what was on the primary flight display (PFD). The company procedure was to look at the ACARS and EICAS to verify flap setting for takeoff.

Captain Morrow did not have any concerns about taking off from Runway 23 at CRW. They hardly ever performed a takeoff from runway 5, and when they did they had to back taxi and would be looking at the cliff edge. They used the entire length of the runway for the takeoff.

The APU was still on at takeoff and the bleeds were on the APU.

He would do the Before Takeoff checklist just prior to taking the runway.

Asked if he performed the takeoff briefing, he said he would hope he did and thought he did it on every leg. He said it was a “pretty standard” briefing and included that it would be his takeoff, he would look outside at the runway, verify they were on the correct runway, verify the runway heading, initial altitude, first fix or turn, and what the procedure would be if they lost an engine.

Captain Morrow was asked to describe the takeoff roll up to the 80 knots call out. He said someone was coming in to land before their departure. They taxied onto the runway and there was a large flock of birds; he thought he said something about that. He did not think they did a max performance takeoff while holding the brakes, but thought a regular 70% engine spool-up was done. It was a “pretty normal” takeoff. The thrust levers were pushed up to 70%, the engines spooled up, they pushed the levers up to the N1 bugs, he said “set thrust” and the F/O said “thrust set”, then there was the 80 knot callout.

He said the F/O was making the callouts and there were no abnormal indications up until the 80 knot callout. The F/O normally called thrust set, 80 knots,  $V_1$ , rotate, and positive rate; he did not call  $V_2$ . He recalled the F/O called “thrust set” and then “80 knots”. At that time, Captain Morrow realized that the flaps were at the wrong setting. In response to the 80 knots callout, his call out would have been “checks” but he did not recall if he said “checks” or not. He said the flaps not being set correctly would have been a reason to abort the takeoff but he did not know why he did not call for the abort. Captain Morrow said he did not try to pull the nose up at anytime during the takeoff roll or rejected takeoff.

Captain Morrow said the abort criteria was abort for any malfunction below 80 knots; between 80 knots and  $V_1$ , abort for an engine failure, fire, or anything that would be “seriously unsafe”. They would not abort past  $V_1$ . He did not think the F/O called out  $V_1$  before he aborted. At PSA, they called it a rejected takeoff.

When he realized the flaps were not at the correct setting, he quickly reached over and changed the flaps to 20. He thought it would solve “the stupid problem” of him missing it earlier. He never did that before. When he put the flap handle down to 20, he got a “config flaps” warning and he was pretty sure he got a “config spoilers” warning also. He was not sure how or why he got the “config spoilers”. At that time, he rejected the takeoff. He did not remember where they were on the runway or at what speed they were at. He said as soon as he moved the flap handle, he got the warning and he rejected the takeoff. He said the last speed he recalled seeing was 80 knots. He said he and the first officer did not think the airspeed got over 100 knots. When told the airspeed that the airplane reached prior to the abort, he said he did not think the airplane was going as fast as it was. He remembered thinking “why are we not stopping”.

Asked to verify that after 80 knots he moved the flap handle, he did not hear the  $V_1$  callout, got red warnings and then aborted the takeoff, Capt. Morrow said yes.

He could not recall what he said at the time of the abort; it was all happening fast. During the abort, he pulled the power back, applied the brakes and did not know why the reversers did not come out. He did not know if it was because he did not get the thrust levers all the way back to idle. He did not recall if he continued trying to get the engines into reverse. He vaguely remembered the F/O saying something to the tower. He used a lot of braking but did not think he was “standing on the brakes”. When they were in EMAS, the captain said his calves were very, very sore. He figured his calves were so sore from applying the brakes very hard as they were getting closer to the end of the runway. He was applying max brakes but did not think he was “pushing them through the floor”, then at the end he tried to push the pedals hard. He did

not recall the anti-skid activating. Captain Morrow said the spoilers normally came out automatically but did not know if they did during the reject.

He said the RTO procedure was power to idle, max braking, and full thrust reversers. Captain does the reject but either pilot can call it.

During the rejected takeoff, the first officer should make normal landing callouts - spoilers, two reverse, 80 knots, and 60 knots. He did not recall if F/O Saltsgaver did that. He did not think the F/O made any callouts, but said maybe the F/O said something over the radio that they were rejecting.

He said he forgot that the EMAS was at the end of the runway.

After the airplane stopped, Captain Morrow remembered thinking "we're stopped, we're here, what's next". He told everyone to remain seated. He thought they completed the After Landing and engine shut down checklists. He was not sure how smoothly they did it. He was "pretty sure" that he asked the flight attendant if everyone was okay but he did not remember specifically what he said to her. He was "pretty sure" she told him that they were all okay.

He said there was a checklist if they were going to evacuate otherwise there was no emergency checklist to complete.

He was asked how the actual N1 setting for takeoff compared with the computed takeoff flex setting and if it was higher or lower. Captain Morrow said he did not remember but was sure it was "around there".

Captain Morrow said checklists were always done. He would call for them and made sure they were done. He did not think he ever had to say anything to someone about their checklists. He was "pretty sure" first officers that he flew with did all checklists. Regarding whether First Officer Saltsgaver did checklists okay, he said "yeah I guess" and said he did not have any problems with how F/O Saltsgaver did them.

He said sterile cockpit rules applied "once we're ready to go"; when they closed the door. Asked if he and F/O Saltsgaver had a sterile cockpit on the incident leg, Captain Morrow said "probably not".

Captain Morrow said he did not conduct line checks because he was only a part time check airman. He "pretty much" just did IOE. Asked if he felt comfortable making suggestions to other pilots to break bad habits during flights, Capt. Morrow said yes. Asked if as a check airman he had ever seen a similar mistake where a new captain called for the wrong flap setting or a first officer set the flaps incorrectly, he said yes.

He knew that sterile cockpit was talked about, but did not know if it was stressed in IOE. He said check airman had a list of items to be talked about and sterile cockpit was discussed. When asked if the company stressed sterile cockpit, he answered yes.

He said the weather the day of the incident was good; it was not raining and the runway was dry.

He said he was given a drug/alcohol test about 4 hours after the incident due to difficulties in finding a facility to perform the test at.

Captain Morrow said there were no restrictions on what activities pilots could do during cruise flight. He said the activities should be terminated probably at descent.

Captain Morrow had previously rejected a takeoff for a “config spoiler” warning at Ronald Reagan Washington National Airport (DCA), Washington, D.C. on a trip pairing with F/O Saltsgaver. He said the airplane had a minimum equipment list (MEL) item and they had to do a test before each leg. The airplane failed the test, then maintenance had them do some resets, and it worked properly. At the start of the takeoff before the plane was even moving, the flight crew got the warning. They exited the runway and called maintenance but they could not duplicate the warning. He did not recall if he had ever aborted above 80 knots before but he was sure that he had to have done so.

Captain Morrow received his training at PSA which included  $V_1$  cuts and high speed rejected takeoffs. He also received training during recurrent ground school on fatigue or fatigue management but could not recall the specifics. Crew resource management training was included in proficiency checks and proficiency training, for example, the instructor would act as a flight attendant. If there was time, they would talk with the flight attendant about the emergency and how much time she had. Asked what training flight crews receive for cabin safety and cabin egress, he said they received doors training and also basic defense moves. He said on the front page of the quick reference manual, there was the evacuation checklist. Also, in the simulator, they did a normal landing and then the instructor would collapse the gear, and the flight crew would immediately go to the evacuation checklist. He said the quality of the training was very good.

Captain Morrow had never received a commendation for his performance.

The interview ended at 1450.

## **5.0 STERILE COCKPIT PROCEDURES**

The PSA Airlines, Inc. Flight Operations Manual, Page 4-36, Section 4.10.11 Sterile Flight Deck, dated October 16, 2009 stated in part:

*During critical phases of flight, PSA Airlines prohibits flight crewmembers from performing non-essential duties or activities.*

### ***Critical Phases of Flight.***

*All ground operations involving taxi, takeoff, and landing, and all other flight operations conducted below 10,000 feet MSL except for cruise flight.*

**•Note •**

***An aircraft stopped on the ground is not in a critical phase of flight.***

***Essential Duties/Activities.***

*Duties/activities required for the safe operation of the aircraft.*

***Non-Essential Duties/Activities.***

*Duties/activities not required for the safe operation of the aircraft.*

The Federal Aviation Regulation 121.542 Flight crewmember duties stated in part:

*(a) No certificate holder shall require, nor may any flight crewmember perform, any duties during a critical phase of flight except those duties required for the safe operation of the aircraft. Duties such as company required calls made for such nonsafety related purposes as ordering galley supplies and confirming passenger connections, announcements made to passengers promoting the air carrier or pointing out sights of interest, and filling out company payroll and related records are not required for the safe operation of the aircraft.*

*(b) No flight crewmember may engage in, nor may any pilot in command permit, any activity during a critical phase of flight which could distract any flight crewmember from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties. Activities such as eating meals, engaging in nonessential conversations within the cockpit and nonessential communications between the cabin and cockpit crews, and reading publications not related to the proper conduct of the flight are not required for the safe operation of the aircraft.*

*(c) For the purposes of this section, critical phases of flight includes all ground operations involving taxi, takeoff and landing, and all other flight operations conducted below 10,000 feet, except cruise flight.*

*Note: Taxi is defined as "movement of an airplane under its own power on the surface of an airport."*

The FAA Aeronautical Handbook, FAA-H-8083-9A, AVIATION INSTRUCTOR'S HANDBOOK, Chapter 8 – Techniques of Flight Instruction, Sterile Cockpit Rule, dated 2008 stated in part:

*Commonly known as the "sterile cockpit rule," Title 14 of the Code of Federal Regulations (14 CFR) section 121.542 requires flight crewmembers to refrain from nonessential activities during critical phases of flight. As defined in the regulation, critical phases of flight are all ground operations involving taxi, takeoff, and landing, and all other flight operations below 10,000 feet except cruise flight. Nonessential activities include such activities as eating, reading a newspaper, or chatting.*

During post-incident interviews, both pilots indicated they engaged in nonessential conversation during the taxi for takeoff.

## 6.0 FLAP PROCEDURES

The PSA Airlines, Inc. Flight Operations Manual, Page 4a-64, dated May 30, 2008 and page 4a-65, dated February 28, 2007, Section 4.6.5 Taxi Check (Challenge & Response, FO Flow), provided the following information. Once clear of the ramp area, the captain was to call for the flaps to be set and state what the flap setting should be. The F/O was to perform the “Taxi Flow” prior to commencing the Taxi Checklist. The “Taxi Flow” called for the F/O to set the flaps to the takeoff setting. The second item on the Taxi Checklist called for both pilots to verify the flaps and trim were set for takeoff and state the flap setting and trim setting.

During post-incident interviews, the captain stated he called for “flaps 20, Taxi Check” when they had departed the gate. The F/O stated that when he responded to the Flaps item on the Taxi Checklist, he stated “flaps 8”. The captain stated that when he responded to the Flaps item on the Taxi Checklist, he did not know if he verified the flap setting and “thought” he just repeated back what the F/O said “which was obviously incorrect”.

## 7.0 REJECTED TAKEOFF GUIDANCE

The PSA Airlines, Inc. Flight Operations Manual, Pages 7-3 and 7-4, dated April 14, 2006, Section 7.1.2 Rejected Takeoff stated in part:

*If the takeoff is rejected with both engines operating, the Captain will retard the thrust levers to reverse while using maximum braking.*

*PSA Airlines recommends an RTO [rejected takeoff] for any malfunction below 80 knots. Above 80 knots, an RTO is recommended for items such as:*

- *Engine failure*
- *Fire warning*
- *Aircraft is considered unsafe or unable to fly*
- *Loss of directional control.*

The manual also stated that either pilot should call “Reject”. A chart in the manual directed the captain to bring the thrust levers to idle, apply maximum braking, and apply maximum reverse thrust consistent with directional control. The chart directed the F/O to make standard landing callouts and notify air traffic control.

In post-incident interviews, the captain stated that at about 80 knots, he noticed the flaps were set at 8 instead of 20 and said he moved the flap handle to the flaps 20 setting. The captain said that when he moved the handle, he received warning alerts in the cockpit and decided to reject the takeoff. Neither pilot recalled stating “reject”. The captain said he did not get the engines into reverse and thought this was due to him not getting the thrust levers back to idle. The F/O said he did not make the callouts as required.

The PSA Airlines, Inc. Flight Operations Manual, Page 7-21, dated July 15, 2009, Section 7.8.4 –  $V_1$ , stated in part:

*$V_1$  is the maximum speed to which an aircraft can accelerate, lose an engine, and either stop or takeoff in the remaining distance.*

In 1994, the FAA published Advisory Circular (AC) 120-62: Takeoff Safety Training Aid, with the purpose of providing guidance to “minimize, to the greatest extent practical, the probability of RTO-related accidents and incidents”. Although the AC guidance applies to FAR Part 121 operators, it is also stated that “many of the principles, concepts and procedures described apply to operations under FAR Parts 91, 129, and 135 for certain aircraft and are recommended for use by those operators when applicable”. The AC provides definitions of speeds and guidance for training.

Specifically, the AC defines  $V_1$  speed in the following way:

*a.  $V_1$ . The speed selected for each takeoff, based upon approved performance data and specified conditions, which represents:*

- (1) The maximum speed by which a rejected takeoff must be initiated to assure that a safe stop can be completed within the remaining runway, or runway and stopway;*
- (2) The minimum speed which assures that a takeoff can be safely completed within the remaining runway, or runway and clearway, after failure of the most critical engine at a designated speed; and*
- (3) The single speed which permits a successful stop or continued takeoff when operating at the minimum allowable field length for a particular weight.*

*Note 1: Safe completion of the takeoff includes both attainment of the designated screen height at the end of the runway or clearway, and safe obstacle clearance along the designated takeoff flight path.*

*Note 2: Reference performance conditions for determining  $V_1$  may not necessarily account for all variables possibly affecting a takeoff, such as runway surface friction, failures other than a critical powerplant, etc.*

In addition, the AC provides the following guidance for training:

*8. TRAINING AID KEY PROVISIONS. The following key elements of the takeoff safety training aid are recommended, as a minimum, for implementation by each air carrier.*

*a. Ground Training. The ground training program should ensure thorough crew awareness in at least the following topics:*

- (1) Proper RTO and takeoff continuation procedures in the event of failures;*
- (2) Potential effects of improper procedures during an RTO;*

*(3) Guidelines on rejecting or not rejecting a takeoff in the low and high speed regimes;*

*(4) Assigned crewmember duties, use of comprehensive briefings, and proper crew coordination;*

*(5) Appropriate selection of runway, flap settings, thrust levels, weight and V speeds relative to takeoff conditions (gross runway contaminants, etc.);*

*(6) Proper use of “reduced VI” policies if used; and*

*(7) The increased stopping distance required on slippery or contaminated runways.*

*b. Flight Training and Checking. Flight training programs and airmen evaluations, to the extent appropriate, using an approved simulator should ensure appropriate crew skill in applying the items listed in (a) above. Simulator scenarios should include the following conditions and procedures:*

*(1) Use of critical weights for a specified runway (e.g., critical field length/balanced field length).*

*(2) Demonstration of the increased stopping distance required on slippery or contaminated runways.*

*(3) Demonstration of the proper and appropriate crew responses for engine failure, tire failure, nuisance alerts, and critical failures that affect the ability to safely continue the takeoff in both the high and low speed regimes.*

Submitted by:

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